June 1952

THE

Johns Hopkins

MAGAZ

SEE PAGE 1

Lieutenant
Stanley T. Adams
Medal of Honor

ONE BITING-COLD FEBRUARY NIGHT, Lieutenant Adams was on a bitterly contested hill near Sesim-ni, Korea. Out of the dark earth the silhouettes of some 150 Communist troops rose up against the skyline. Ordering fixed bay-

onets, the lieutenant, with only 13 men, leaped up and charged furiously against the overwhelming odds. He was knocked down by a bullet. At least three hand grenades actually bounced off his body before exploding nearby. But when Adams and his squad were through, there were only 50 Communists left on the hill—and they were dead.

"Nobody likes to kill," says Stanley Adams. "Nobody likes war. But today the surest way to invite a war is to be weak. You and I know that twice in the last ten years Americans have let their guard down. And the Philippine and Korean graveyards are filled with men who paid the price for it.

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THE Johns Hopkins MAGAZINE

VOLUME III June, 1952 NUMBER 9

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The Cover

Don Kniffen, pictured on this month's cover in his role of varsity baseball manager, is one of the four occupants of suite C-33 at Johns Hopkins' Alumni Memorial Hall. With the help of Don and his three roommates, The Johns Hopkins Magazine this month views life in a university dormitory in the picture story which begins on Page 11.

Photograph by Robert M. Mottar

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EDITORS' NOTES
AN INFORMAL REPORT

Readers of this magazine who are also readers of *Fortune* Magazine may have noted with particular interest *Fortune's* handsome portfolio of color pictures this spring on the great new Chesapeake Bay Bridge, now nearing completion. *Fortune's* photographs were by Robert M. Mottar, whose exciting picture story on the Bay Bridge in our December issue evoked one of the heaviest (and pleasantest) reader-responses we have ever received.

Mr. Mottar carried out his Bay Bridge assignment for *The Johns Hopkins Magazine* with three cameras strung around his neck—one of them loaded with color, the others with black-and-white film. Much as we would have liked to publish the color pictures as well as the black-and-whites, budgetary limitations forbade. We're delighted that they got the wide circulation they deserved through the pages of *Fortune*, a publication whose printing budget is a bit abler to cover such things than ours.

This is as good a place as any to relate an incident which occurred in connection with that Bay Bridge story, and in which Photographer Mottar was rather deeply involved—to the extent of a fathom or so, in fact. During the week he was shooting his pictures, the editors of this magazine (who had become accustomed to Mottar's habits of stopping at nothing to get good pictures) kept their fingers tightly crossed, hoping that nothing would happen to him as he crawled across narrow steel beams a couple of hundred feet above the Bay.

Everything went well until his final day of shooting, on which gray clouds gathered over the Chesapeake and a strong windstorm blew in from the Northeast—a splendid opportunity, Mottar felt, to round out his story with pictures of a gale-whipped Bay and menacing skies over the bridge.

To come to the brutal point quickly: Mottar fell in.

The crew of the launch he had been riding fished him out, but not before his cameras, lashed to his body, had been thoroughly bathed in the salt water of the Bay and ruined beyond repair. The loss came to well over a thousand dollars (insured), the Bay Bridge story went to press without any photos of that cloudy, windswept day, and Mottar was back on the job for us at nine o'clock that evening to start in on his all-night coverage of "Hospital at Night," another of our most popular stories of the year. With a borrowed camera he kept going until 7 a.m. next day.

Our colleague Lynn Poole announced at the end of one of his coast-to-coast television shows this spring that he'd be glad to send, to anybody who requested it, a reprint of this magazine's picture article, "Education by Television" (March), which told how his show, The Johns Hopkins Science Review, is produced. Mr. Poole optimistically ordered three housand reprints from us and settled back confident that he'd have enough not only for the viewers who wrote in but for all other purposes for years to come.

Two mornings later, Poole got a frantic phone call from the Johns Hopkins postoffice, and a couple of minutes later, *we* got a frantic phone call from *him*. Seems that the power of television—especially the power of a science program on television—was greater than anybody, even the gentlemen whose business it is to study such things, had ever suspected. The postoffice was swamped and (after a couple of truckloads of mail had been delivered to Homewood House, where he operates) Mr. Poole was swamped, too, although understandably happy about the whole thing.

By the end of the week, the reprint order had been upped to eight thousand copies and, when all precincts were finally heard from, even that proved to be an inadequate supply.

Which indicates something about the public appetite for television shows which require more serious viewing than the usual fare served up on the

coaxial cables. Whatever it is, the Science Review regards it as a highly encouraging sign of the times.

Other stories which originated with this magazine also went on to wider audiences in the past year. Pictures which Jack Engeman made for our "Demonstration School" article (November) are *still* in demand. *Pageant* Magazine gave them an eight-page spread in February, educational publications have requested reprint rights, and (judging from the inquiries which we continue to receive) they'll be appearing in textbooks for years to come.

Most widely printed of all, perhaps, were photos from the "Birth of a Flame" picture story which *Johns Hopkins Magazine* readers again saw first (in our June, 1951 issue). Made at the University's Applied Physics Laboratory, they have appeared in *Time*, *Business Week*, *Pageant*, and uncounted scores of newspapers and picture supplements here and abroad. The latest report is that they are currently occupying a place of honor at an international photography show in Lucerne, Switzerland; they were similarly honored when they were cited as some of the most noteworthy photographs of the year in the 1952 edition of *U.S. Camera*.

Just before Christmas, *Look* Magazine reprinted the pictures and text from "Troubled People Meet," the group psychiatry article which appeared first in our May, 1951 issue; photographs were by Mottar, text by staff members of the Phipps Clinic at Johns Hopkins. And Werner Wolff's "Operation Firefly" photographs, which were published here last month, have appeared in *Life*.

All of which is naturally a source of great satisfaction to this magazine (and we hope to its readers). But the real credit for such recognition, of course, belongs to the photographers who did the work.

With this issue, *The Johns Hopkins Magazine* rounds out Volume III and its second full year of publication. As is our custom, no issues will be published during the months of July, August, and September. The October issue, first of our next publication year, will go into the mails on September 22.

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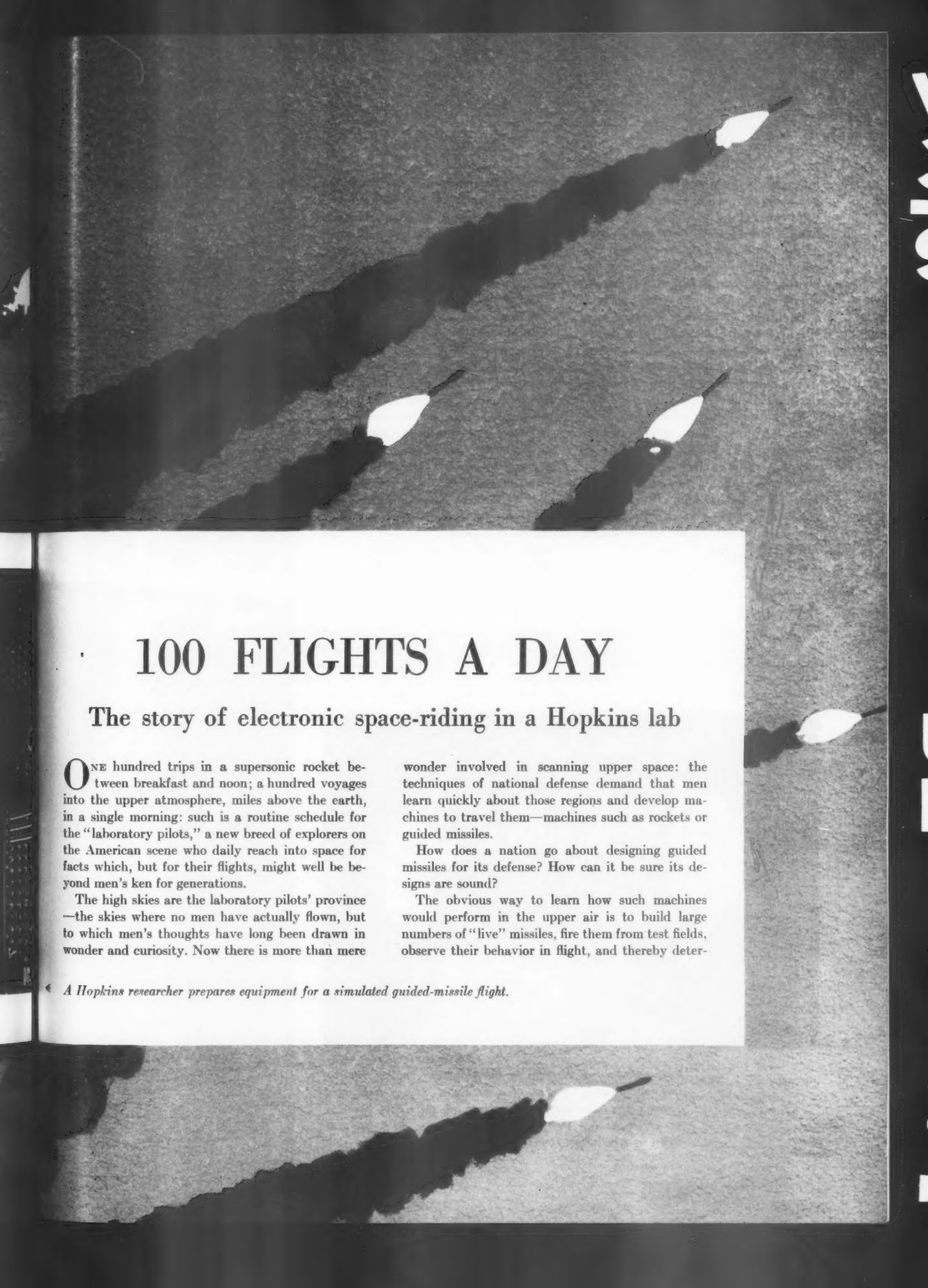

100 FLIGHTS A DAY

The story of electronic space-riding in a Hopkins lab

One hundred trips in a supersonic rocket between breakfast and noon; a hundred voyages into the upper atmosphere, miles above the earth, in a single morning: such is a routine schedule for the "laboratory pilots," a new breed of explorers on the American scene who daily reach into space for facts which, but for their flights, might well be beyond men's ken for generations.

The high skies are the laboratory pilots' province —the skies where no men have actually flown, but to which men's thoughts have long been drawn in wonder and curiosity. Now there is more than mere wonder involved in scanning upper space: the techniques of national defense demand that men learn quickly about those regions and develop machines to travel them—machines such as rockets or guided missiles.

How does a nation go about designing guided missiles for its defense? How can it be sure its designs are sound?

The obvious way to learn how such machines would perform in the upper air is to build large numbers of "live" missiles, fire them from test fields, observe their behavior in flight, and thereby deter-

A Hopkins researcher prepares equipment for a simulated guided-missile flight.

mine the adequacy of their design. But no laboratory, even with government help, could afford to build and test the hundreds of missiles which such a program would require. Nor could the mass of data radioed back from the missiles by telemetering be adequately analyzed. Furthermore, the inherent differences in supposedly identical missiles caused by manufacturing tolerances would tend to conceal the true effects of the subtle design changes which engineers might wish to introduce and test.

So the laboratory pilots have come onto the scene: men whose rocket-launching and space-riding are done in simulated form, electronically. Their flying never takes them or their instruments off the ground. It is quick, economical, and—in terms of the information about rocket performance which they gather—uncannily like the real thing.

In three or four large rooms at the Johns Hopkins University's Applied Physics Laboratory at Silver Spring, Maryland, such simulated flights are regular occurrences. There work the men and women of the Laboratory's "REAC" or computing group, amidst a complex array of black cabinets, oscillographs, dials, switches, and recording needles that trace irregular lines on moving graph paper.

The computing group's primary job is to make mathematically simulated flights to check the suitability of a certain type of control system for missiles, to determine the best settings of various adjustments, to determine the tolerances in such adjustments, and to predict the performance of the completed guided-missile system under various flight conditions. The flights are carried out on the REAC—the Reeves Electronic Analogue Computer, an instrument on which physical quantities such as accelerations, velocities, positions, distances, air densities, and angles of attack are represented by electrical voltages. Such analogue machines form one of the two classes of computing machines; the other, general-purpose digital machines (frequently miscalled "electronic brains"), is composed of instruments which actually

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APPLIED PHYSICS LABORATORY

Four members of the staff of the Hopkins Applied Physics Laboratory watch the story of a simulated missile flight as it appears on a recording machine wired into the REAC machine on which the run is being made. Right, *an APL-developed rocket in actual flight from deck of a naval vessel.*

Thoughts on commencement by the late president of Johns Hopkins

On Becoming A Freeman

By ISAIAH BOWMAN

In England there is a title known as Freeman. It may be acquired, to take the specific example of York, in one of three ways. First, by birthright: by being the son of a Freeman. This is called "Freedom by His Father's Copy." Second, by service: through apprenticeship and learning a trade. Third, a man may become a Freeman by Redemption, by Order of the Court of Mayor and Alderman. This is for men of great achievement.

These ancient institutions, approved by the town and built into honorable traditions, are worth looking at more closely as you stand at the turn of the road to which you have come on Commencement Day. These ways of acquiring honor and status illustrate more than the words at first might seem to mean.

Each year, a Freeman of York receives one or two shillings of rent from the income paid to the town for the use of the pasture that is common land—the commons, just outside the city. When a visiting celebrity arrives, only Freemen may join in the formal part of the procession. Like our own academic procession, this is not merely a pageant; it is history and achievement, service and responsibility, given a symbolic expression.

Today you have a procession of your own. You have earned a right to be there. You have become part of a symbolism. May we ask you henceforth to cherish in action and memory what the procession means, what your place in it implies, what spiritual significance we see in the symbolism.

You are now a joint inheritor of a tradition reaching far back into the centuries—to the beginnings of schools and universities. When you came here as your Father's Copy, to quote the York phrase, you were already possessed of a birthright that qualified you to become a Freeman. Indeed you were free in a sense so large and important that as long as you live you will grow always more appreciative of what you were at birth because you were born in America.

You have been free in America in a sense unsurpassed in all the lands of the world. Generations of young men before you read about freedom in books and newspapers. It was theory to them. In America we have taken freedom for granted. It will never be the same way again.

We shall fail in our schools and colleges if we do not constantly remind our students of the terrible consequences of forgetting the roots of the tree of freedom in our admiration of its lovely crown. Future histories of America will remind your successors in these classrooms at Hopkins how narrowly we escaped slavery in the 1940's. Military experts will tell those successors how narrowly we escaped invasion and the bombing of our cities. They will warn us of the positive and continuing actions that we must take to avert the possibility of such a fate in the future. Freedom by Your Father's Copy is only a running start. You have had privileges up to now. How will you safeguard those privileges for others? Education itself is a privilege when carried to this point in a young man's life. What are the equal responsibilities?

Unlike the corporation of the City of York, this University expects you to be a Freeman in three senses, not in one only: a Freeman who has acquired the power of rendering trained service and who also one day expects to reach and is expected to reach the heights of great achievement. The service to which we refer follows naturally upon the apprenticeship you have served here. Like the his-

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An economics professor examines a situation in which the academic profession may have

"Nothing To Lose But Its Brains"

By CLARENCE D. LONG

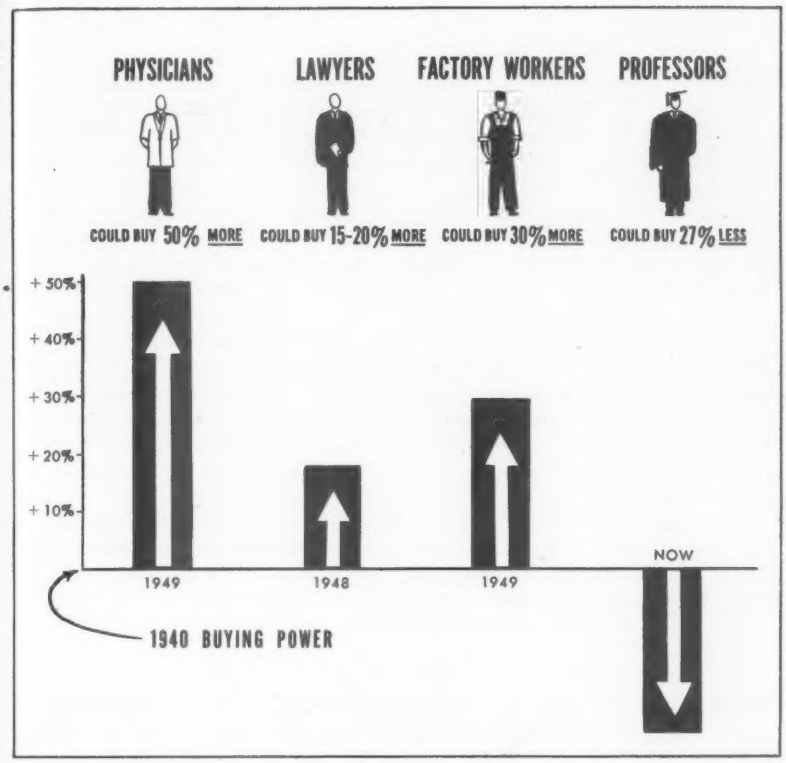
WHAT American can fail to acknowledge, even in the midst of grumbling about the inflation, that these are times, if not of peace, at least of plenty for most of his countrymen? If he is a practicing physician, he earned half again as much buying power in 1949 as in 1940; if a lawyer, a fifth more in 1948 than in 1941; if a factory worker, a third more in 1952 than in 1940. For these and for many others, earnings have done better than keep up with prices; they have moved ahead of them —far ahead even of income taxes.

For the university professor, the race with living cost has been a less gratifying competition. At Johns Hopkins the faculty is, or at least is intended to be, the pick of the country; its instructors are the most promising men coming out of the graduate schools; its professors, more often than not, can list several significant books or a score of major papers in their *Who's Who* biographies and are usually included in any list of notable men in their fields. The owner of a Ph.D. degree attracts no more attention than the possessor of two legs. For this unusual competence, the average teacher on the Johns Hopkins arts and engineering campus receives $5,800 a year—a few hundred dollars more than a first-class barber; yet salaries at Hopkins compare favorably with those at all except a few top-paying universities. They stand substantially below the levels at Harvard, Columbia, Yale, and (very likely, although it does not disclose its rates) the University of Chicago, and a small distance under those at Princeton, Illinois, and Michigan.* But among a dozen leading universities, Hopkins pays probably ninth ($3,575) for instructors, sixth ($4,950) for assistant professors, fifth ($6,325) for associate professors, and eighth ($8,140) for full professors. The average at Homewood may be no worse than eighth for the nation among liberal arts institutions with graduate schools.

BUT if Hopkins does not pay seriously less than other leading privately endowed universities, is this the good fortune of its personnel or the bad luck of professors generally? In 1940 the average for the faculty was $4,000. In the dozen years since, the increase has been just half the ninety per cent rise in Baltimore living costs, with the result that my typical colleague now receives only $3,000 in 1940 buying power —and after income taxes, only $2,700.

These are averages for all ranks. For the full professor the earnings are greater, but the loss in the last twelve years has been severest of all. In 1940 the professor whose salary was median (halfway down in a list from highest to lowest in his rank) earned $5,700; today, in terms of pre-World War II dollars, he receives $4,154. The decline in purchasing power of twenty-seven per cent—before a single per centum is deducted for income tax—would outrage anybody but a teacher.

* This disparity is not relieved by any demonstrably lower expense of living. According to the Bureau of Labor Statistics, one to three per cent *more* money is required to buy the same list of food, housing, goods, and services in Baltimore than in New York or Chicago, and only one per cent less than in Boston or San Francisco. Least favorably situated, relative to the other universities', are Hopkins full professors, who would have to have a fifteen per cent rise to be as well off as persons in that grade at Columbia and Yale and fifty per cent more to be on a par with individuals of the top rank at Harvard.



The trend has not differed at large state universities, where a full professor's salary will buy less than in 1940, or 1929—and no more, in fact, than in 1908. Associate and assistant professors at these tax-supported places earn slightly more than in the earlier two years but less than in the year before the war. The middle-aged college professor, particularly the philologist, the historian, the philosopher, or even the theoretical scientist (rarely besieged with chances to supplement his pay), is not sharing in the American prosperity and, except for fleeting periods, has probably not shared in it during his lifetime.

But what about outside earnings? Isn't the professor able, through book-writing, summer teaching, or industrial consulting, to maintain his real income or keep it in line with other occupations?

Dr. Long is Professor of Economics at Johns Hopkins. This study was prepared with the help of Carl Christ, P. Stewart Macaulay, and Henry S. Baker, of Johns Hopkins; the administrations of the other universities cited in the article; George Stigler, of Columbia University; and Susan Dischka.

An occasional academician, with a flair for merchandising learning, does manage, of course, to convert enough wisdom into cash to bring his income up to that of an average doctor in an average community. But the vast majority live almost entirely on checks from their universities. Indeed, a study of scientific fields, hardly the poorest for extracurricular money-getting, disclosed that only half of the faculty members had extra earnings in 1948 and that the median added income of these fortunates was only one-sixth of their regular salaries. "College teaching," a hard-pressed colleague of mine recently remarked, "has nothing to lose but its brains." His remark was not entirely in jest. One may indeed wonder how long able men will continue to enter the exacting field of higher learning and remain in it, resistant to tempting offers in business and government and philosophical about the kindly patronage of better-heeled relatives.

Of course, to the professor, wage cuts by inflation are no novelty. A quick review, covering state universities, discloses that in past war-and-depression variations, academic salaries have not responded at all to minor price changes and have lagged far behind major price movements both in timing and in amplitude.

Real academic incomes have thus tended to vary *oppositely* to prices. After remaining constant during 1908–15, except for a brief upward bulge in 1909–10, they dropped precipitously during World War I, as prices rose sharply while nominal salaries stayed almost the same, and in the year following the victory they were only two-thirds the 1908 level. Over the next decade real salaries climbed steadily, as prices stabilized while nominal pay continued a brisk ascent for ten years. By 1929 they had managed to get back to where they had been in 1915—fourteen years before. By 1932, when prices touched their lowest depth, professors' incomes in dollar terms had attained a summit and in command over commodities achieved their best in the period under review, though it took the deepest depression on record to bring the professor his brief prosperity. As prices turned up during the latter part of the 1930's, real salaries sagged but did not give up all their gains. With the post-World War II inflation, however, they deteriorated rapidly and by 1952 were again at 1908 levels.

What accounts for this singular inability of the pedagogue to hold his place at the American banquet table? There is certainly no single reason, but a partial explanation may perhaps be found in a combination of financial and physical factors.

The usual explanation is paucity of private endowments in the universities, and there is no denying that income-yielding assets have been diluted by both the rise in prices and the huge increases of students and teachers. Per member of staff in all institutions of higher learning, investments are below what they were in 1940, even in inflated dollars—and in purchasing power they are scarcely two-thirds their level in 1940 or half what they were in 1929 and 1908. The decline in interest rates has depressed them still further in income yield.

(Against this gloomy background, the picture at the Homewood divisions of Johns Hopkins is fortunately no

darker than gray. Endowment income allotted to the Faculties of Philosophy and Engineering has managed to offset the rise in living cost, but has been watered down by the doubling in faculty. In constant dollars, it was only $935 per teacher in 1950 compared with $2,100 in 1940.)

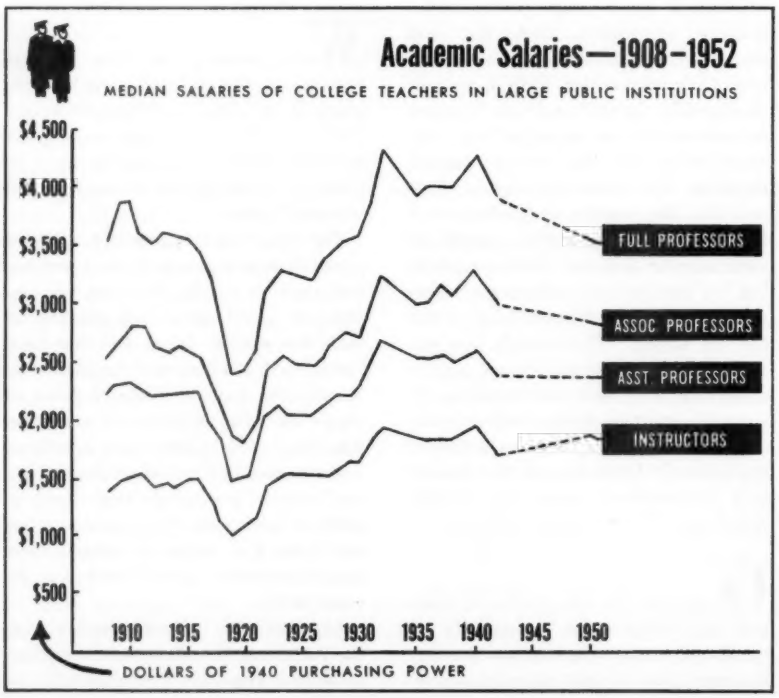
NEVERTHELESS, I do not believe this dilution is by any means the entire explanation. For one thing, state universities—which put little reliance on endowments and in some cases get more money from their legislatures in a single biennium than the entire wealth accumulated by Hopkins since 1875—have pushed up salaries no faster than private institutions. Not a single publicly-supported university belongs today in the first rank of compensation, and only Illinois and Michigan seem to pay better than Johns Hopkins.

Besides, there has been no failure of over-all revenues to keep pace with either the number of faculty or the price level. The educational and general income of the nation's higher institutions went up from $4,300 *per member of the staff* in 1940 to $7,900 in 1948, an increase of eighty-three per cent, compared with a seventy per cent rise in living costs. In the aggregate—and with the help of the Federal government—the universities took in *more* purchasing power per teacher but paid him *less*. What happened to the difference? It was spent on (a) administration and (b) operation of physical plant. As an example, sixteen private universities in the Northeast received in 1948 thirty-five per cent more income per student than in 1938 but spent only twenty-nine per cent extra on instruction, compared with thirty-four per cent more per student on administration and fifty-seven per cent additional on plant maintenance.

(Incidentally, it is pleasant to report that Hopkins is an exception to this distressing trend toward emphasis on the physical and bureaucratic aspects of the higher learning. Between 1940 and 1950, expenditure on instruction and departmental research rose from seventy-two to eighty-two per cent of the educational budget at Homewood and from sixty-eight to seventy-six per cent at the Schools of Medicine and Hygiene. Outlays on physical plant and administration went *down* as a percentage on both campuses.)

The remainder of the financial explanation lies in the hesitancy to raise tuition. At Johns Hopkins, for instance, student fees have gone up in the same proportion as salaries: forty-five per cent, or half the ninety per cent rise in living cost in Baltimore. Ability to pay, reflected by personal incomes of Americans per capita (after income taxes), is in comparison two and a half times what it was in 1940.

Thus the Johns Hopkins student is paying twenty-five per cent *less* real tuition, while his family's real income per capita after taxes, unless it deviates sharply from the national average, is *up* nearly thirty-five per cent. Because fees have not kept pace with other economic trends, a bachelor's degree is an outstanding bargain, subsidized in good part by the professor, who borrows his books instead of buying them, takes his exercise on his lawn instead of the golf course, and gives up his preprandial cocktail; or by his wife, who wears her dresses longer, lets go her Wednesday cleaning woman, and stays behind with the children when her spouse goes to Europe on an invitation lectureship.



How has this situation been permitted to happen? It is not, of course, easy to say, but one factor must surely be the time required for nearly two thousand administrations to grasp a situation and for their boards of trustees to act upon it. In the face of nationwide inertia, even the most farsighted university cannot get its fees much out of line. (However, Johns Hopkins' tuition, until recently the same as that at most private eastern institutions, is now only $650, while recently the rates at Princeton, Yale, Lafayette, and Columbia have gone to $750 and at Harvard to $800.)

But the failure to raise tuition is probably more the effect than the cause of the lag in salaries. When it becomes necessary to raise academic pay, tuition rates will go up the nation over, and fairly rapidly. The real cause of both low salaries and low tuition is, I am inclined to believe, that the universities have not been faced with any manifest shortage of teachers. The modest boom in real incomes for professors during

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From widely separated sections come the four occupants of Suite C-33 at Hopkins' Alumni Memorial Hall (*background*): Lowell ("Dink") Wilson, California; Al Kaplan, New York; John Gallagher, Ohio; and Don Kniffen, Louisiana.

Dorm Room

The story of four students from four parts of America who share quarters in Hopkins' Alumni Memorial Hall

Photographs for The Johns Hopkins Magazine by Robert M. Mottar

It is seldom listed in the catalogues. But nevertheless one of the most valuable benefits of university life is the opportunity for students to meet and work and live with men of backgrounds, interests, and aims different from their own.

Nowhere are such opportunities more abundant than in a university dormitory. Here, living closely together, are students from all parts of the country and many parts of the world. They stem not only from different geographical origins but from different economic, social, and scholastic backgrounds as well.

Here is the story of four such students. They come from California, New York, Ohio, and Louisiana. Their interests and fields of study are as varied as their home states. Last fall, they found themselves assigned to the same living quarters: Suite C-33 in Johns Hopkins' Alumni Memorial Hall. Here, in pictures, is how they have become a close-knit, lively crew.

The four came to Hopkins with different interests

Far-Westerner

Lowell Wilson, whom everybody calls "Dink," is 19 and comes from Richmond, California. An open-scholarship man, he majors in biological sciences.

Mid-Westerner

John Gallagher, 19, is, like his four roommates, in his first year at Johns Hopkins. He comes from Canton, Ohio, won an open scholarship, and majors in physics.

Southerner

Don Kniffen, 19, is from Baton Rouge, Louisiana. A mechanical engineer, he has open scholarship. He collected road-maps which hang on walls of room.

Easterner

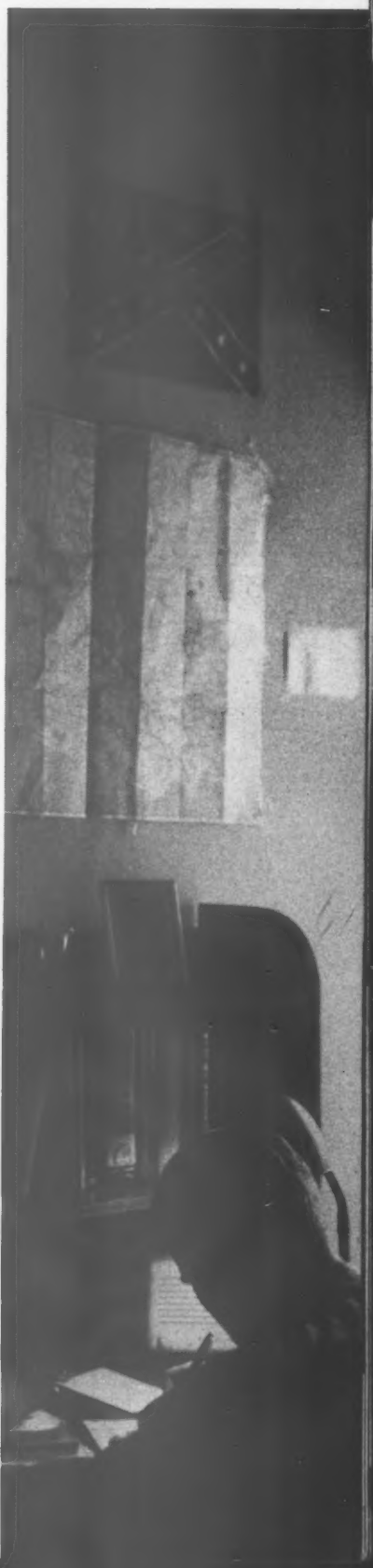
Al Kaplan, 18, is the youngest of the four students in Suite C-33. His home is in Brooklyn, New York. Chemistry and physics are his fields of interest.

Don, an engineering student, works in drawing laboratory.

Don flies flag of Confederacy

Injury keeps him from sports but he manages baseball team.

Don is a trombone player both officially, in the Hopkins band, and unofficially, in dormitory jam sessions (*Page 19*). *Right*, he writes to girl friend at L.S.U., whose photo is on desk.



John and Al both are studious, musical

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John plays clarinet in University band. *Left,* in band office, he tries out instrument prior to band's appearance at Alumni Homecoming (*above*).

Al and John study chemistry together. Each man in room has desk, but beds are scene of as much studying as desks are.

In analytical geometry class, Al records a formula inside cover of textbook. For recreation, he and John took up fencing this year and both made freshman team.

As hobby, John is making translation (*above*) of *William Tell*. Al has pooled funds with two others to buy classical records (*right*).

Dink is room's sportsman

Dink joins roommates in game of cribbage before dinner.

He was high scorer on freshman basketball team, has had pro baseball offers.

Burning lights late, Dink prepares for final exams this spring.

In biology lab, he works on insect-dissection. Biology is Dink's major.

But varied as their individual interests are, as the preceding pages show, the four have developed many ideas in common and a strong *esprit de corps*. For a glimpse of their activities together in the dorm, see the next two pages.

Spring balminess pulls dorm residents outside. Three study (*top*) as Don (*left*) kibitzes card game.

In commons room, Al, John, and Don talk with Bill Blanco of Venezuela.

Dorm men study hard and relax energetically

As end of academic year approaches, dormitory lights burn later and later. *Right*, 1 a.m.

But there is time for jam sessions. This one brought howls from men next door. ➤

This new aerial photograph shows the central part of Johns Hopkins' Homewood campus. Engineering buildings are at left; Homewood House is at upper right of horseshoe drive in center foreground. Above it, counter-clockwise around central quadrangle, are Remsen, Mergenthaler, Gilman, and Rowland Halls. Jenkins Biophysics Laboratory adjoins Mergenthaler; newly dedicated Guy Memorial Walk is to right of Remsen and Mergenthaler Halls. Levering Hall and Aeronautics Building are to left of Gilman.

ROBERT F. KNIESCHE

NEWS at Johns Hopkins

A digest of developments at the University and Hospital in recent weeks

BILLION-VOLT BULLETS

On May 20 the giant cosmotron at Brookhaven National Laboratory produced the first billion-volt atomic bullets ever made by man. For the first time man created in the laboratory atomic bullets which carry the energy of cosmic rays.

The event was compared with the experiment in 1942 when the first self-perpetuating nuclear chain reaction was started. As that experiment showed that the creation of an atomic bomb was feasible, so this one leads scientists to conjecture that it will be possible for man to create protons and neutrons, the fundamental particles of the atomic nucleus. The earlier experiment had pointed the way to the conversion of matter into energy. With billion-volt atomic bullets, scientists hope to achieve the opposite—and more rewarding—conversion of energy into matter.

The cosmotron consists of a circular magnetic track, sixty-five feet in diameter and two hundred and four feet in circumference. It has been under construction for several years, and the first test on May 20 had been expected to do little more than indicate what adjustments would be needed to make the machine work. A stream of protons was passed into the track and accelerated by electric pulses. In seven seconds the protons traveled around the track two million times, reaching a speed of 175,000 miles per second or ninety-five per cent the speed of light. The protons moved with an energy of 1,360,000,000 volts, three times that produced by any atom machine in existence yet only half the energy which the cosmotron is expected to produce.

This achievement opens a field of experiment which has scarcely been touched. Cosmic rays, previously observed only as they bombard the earth from outer space, now may be produced artificially and studied under controlled conditions. Using the high-powered bullets, scientists will break up atoms with the expectation of discovering many of the basic secrets of the universe.

The cyclotron is only one of the projects being carried on at Brookhaven National Laboratory. Located on Long Island, the Laboratory is operated under contract with the Atomic Energy Commission by Associated Univer-

sities, Inc., a group of nine schools—Johns Hopkins, Yale, Columbia, Princeton, Harvard, Cornell, Rochester, Pennsylvania, and the Massachusetts Institute of Technology.

THE FACULTY AND STAFF

● President Detlev W. Bronk last month addressed the Conference on Operations Research held in Washington and the Honors Day Convocation at Virginia Polytechnic Institute. He attended the sesquicentennial celebration at West Point as a representative of the University, the National Academy of Sciences, and the American Association for the Advancement of Science.

Dr. Bronk delivered the installation address at the inauguration of Dr. John T. Rettaliata as president of the Illinois Institute of Technology. He was scheduled to act as chairman of the opening session of the Symposium on Quantitative Biology, held on June 6 at Cold Spring Harbor, New York.

● In the Faculty of Philosophy, Ralph D. DeMoss has been appointed assistant professor of biology.

Richard A. Mumma has been promoted to the rank of associate professor of education.

Don Cameron Allen has been named acting chairman of the department of English for the coming academic year.

H. Carrington Lancaster is retiring to become research professor of French literature.

J. T. Singewald, Jr., is retiring this June as professor of geology.

Francis J. Pettijohn has been appointed professor of geology.

V. P. Sokoloff has been named visiting professor of geography for the coming academic year.

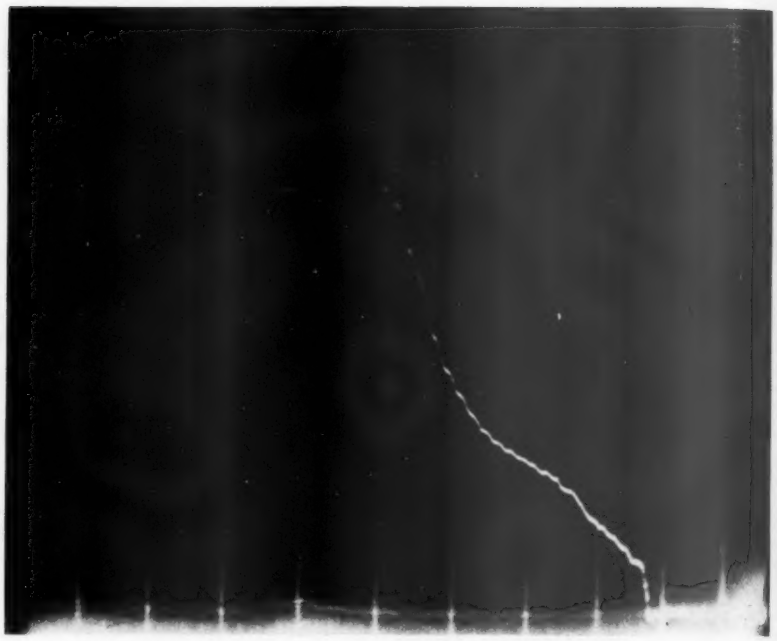
Ernst Feise is retiring as professor of German.

Bernhard Blume has been named professor of German, the appointment to become effective in July.

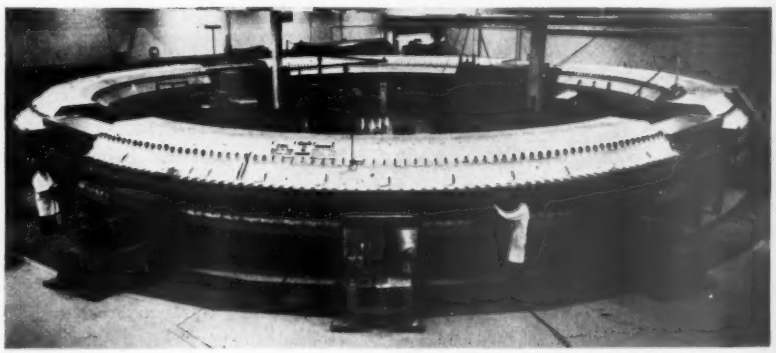
C. Vann Woodward, professor of American history, was awarded the Bancroft Prize by Columbia University in recognition of his book, *Origins of the New South*.

David Spring, assistant professor of history, will spend the next year in England continuing his research into the background of the English landed aristocracy.

Nesmith C. Ankeny and George Daniel Mostow have been appointed assistant professors of mathematics.



Here is an actual photograph of the screen of an oscilloscope at Brookhaven National Laboratory as atomic particles were accelerated on May 20 to 1.3 billion volts by the Laboratory's cosmotron, below. *Trace* (above) *indicates the beam intensity as it is being accelerated in the magnet gap. The lateral extent of the trace indicates the length of time the beam traveled around the magnet.*



C. L. Siegel has been appointed visiting professor of mathematics for one semester of next year.

Leon Madansky has been promoted to associate professor of physics.

Harold W. Hake has been named assistant professor of psychology.

Leo Spitzer, professor of Romance philology, will conduct three courses at the summer session of the University of Southern California.

James C. McLaren has been promoted to assistant professor of Romance languages.

● In the School of Medicine, Samuel J. Crowe will retire this month as professor of laryngology and otology and otolaryngologist-in-charge of the Hospital. He will be succeeded by John E. Bordley, now associate professor of laryngology and otology.

Helen B. Taussig, associate professor of pediatrics, has been elected president of the Heart Association of Maryland.

William Mansfield Clark, professor of physiological chemistry, was chosen to make the Remsen Memorial Lecture of the American Chemical Society, Maryland Section. Dr. Clark will retire this year to become research professor of chemistry in the faculty of philosophy. He will be succeeded as professor of physiological chemistry by Albert L. Lehninger.

Grant E. Ward, associate professor of surgery, has been awarded the Amer-

ican Cancer Society's medal for distinguished contributions to the control of cancer.

Alfred Blalock, professor of surgery, has been named to the "South's Hall of Fame for the Living."

• IN THE SCHOOL OF HYGIENE AND PUBLIC HEALTH, Anna M. Baetjer has been promoted from assistant professor to associate professor of environmental medicine.

Abraham Morris Lilienfeld has been named assistant professor in epidemiology.

• IN THE SCHOOL OF ENGINEERING, Robert Ayre will take the post of associate professor of civil engineering this July.

Willis G. Gore has been named assistant professor of electrical engineering.

Sidney Davidson has been promoted to associate professor of industrial engineering.

M. K. Chen and Hsuan Yeh have been appointed assistant professors of mechanical engineering.

• AT THE APPLIED PHYSICS LABORATORY, new members of the staff include Frank W. MacDonald, former commanding officer of the Office of Naval Research, Pasadena, Cal.; Edgar L. Smith, formerly with the Air Force Missile Test Center in Florida; Zanville M. Raffel, of the McDonnell Aircraft helicopter division; and Reuel Platt, Jr., from the Naval Ordnance Laboratory.

POLIO VACCINE

A new serum has been developed which researchers believe can immunize humans against the paralyzing form of poliomyelitis. The vaccine has been used successfully on diseased monkeys in what scientists describe as a virtually exact simulation of what happens to humans in a polio epidemic.

The experiments were announced by Dr. David Bodian, associate professor of epidemiology at Johns Hopkins, and Dr. Dorothy M. Horstmann, assistant professor of preventive medicine at Yale, at the April convention of the Federation of American Societies for Experimental Biology. "From our tests," Dr. Bodian stated, "it would appear that paralytic poliomyelitis should be one of the most readily preventable diseases by use of prophylactic immunization."

The doctors described polio as a two-stage disease. The first stage is benign, the viruses appearing in the blood stream without causing serious illness; it is estimated that eighty per cent of American adults have had polio in this benign form, most of them without being aware of it. Not until the second stage do the viruses reach and destroy the nerves, thus causing paralysis. The vaccines may not affect the benign stage, but a small amount injected into monkeys has protected the animals from paralysis.

The vaccine consists of a human blood fraction containing antibodies from a recovered polio victim.

ALUMNI ELECTIONS

The Johns Hopkins Engineers met at Homewood on May 16 for dinner and to hear an address by John Rettaliata, newly elected president of the Illinois Institute of Technology. They elected a slate of officers for the 1952–53 season: Kent R. Mullikin, president; Howard A. Frey, vice president; Louis Koerber, secretary-treasurer; Walter C. Boyer, Frank C. Dehler, Arthur G. Foster, William A. Gerstmyer, Arthur M. Gompf, and Louis G. Smith, members of the executive committee.

At the April 25 meeting of the Delmarva alumni group, the following officers were elected: Richard R. Griffith, president; W. Edwin Bird, Jefferson D. Blackwell, Leonard A. Covell, William D. Noble, and Philip E. Nuttle, vice presidents; Elinor D. Hartnell, secretary-treasurer.

The New York area alumni asso-

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Researchers at Johns Hopkins and Yale have developed a vaccine which they believe can immunize humans against the paralyzing form of poliomyelitis (see story on this page). *Here, Drs. David Bodian and Howard A. Howe, of the epidemiology department of the Hopkins School of Hygiene and Public Health, examine a monkey used in developing the new serum.*

The Year In Hopkins Sports

SOCCER

Towson	3;	Hopkins	2
Hopkins	3;	Gettysburg	3
Franklin & Marshall	3;	Hopkins	1
Hopkins	3;	Drexel	3
Hopkins	2;	Western Maryland	0
Hopkins	3;	Washington	3
Maryland	3;	Hopkins	2
Delaware	2;	Hopkins	1

FOOTBALL

Franklin & Marshall	52;	Hopkins	7
Susquehanna	47;	Hopkins	32
Hopkins	20;	Hampden-Sydney	20
Randolph-Macon	38;	Hopkins	32
Gettysburg	27;	Hopkins	7
Hopkins	39;	Swarthmore	6
Hopkins	34;	Dickinson	13
Western Maryland	33;	Hopkins	6

CROSS-COUNTRY

Hopkins	29;	Franklin & Marshall	26
Washington	40;	Hopkins	19
Catholic	40;	Hopkins	21
Hopkins	43;	Delaware	19
Loyola	38;	Hopkins	22
Swarthmore	30;	Hopkins	27

FENCING

Hopkins	14;	Y.M.C.A.	13
Hopkins	14;	Temple	13
Hopkins	16;	Virginia	11
Hopkins	15;	Lafayette	12

BASKETBALL

Hopkins	64;	Swarthmore	63
Delaware	70;	Hopkins	52
Princeton	83;	Hopkins	53
Hopkins	79;	Gettysburg	70
Hopkins	83;	Towson	64
Hopkins	72;	Catholic	48
Navy	97;	Hopkins	58
Hopkins	62;	Towson	50
Virginia	92;	Hopkins	76
Hampden-Sydney	84;	Hopkins	53
Loyola	68;	Hopkins	51
Western Maryland	65;	Hopkins	45
Washington	69;	Hopkins	68
Hopkins	64;	Randolph-Macon	56
Loyola	88;	Hopkins	74
Hopkins	69;	Western Maryland	57
Rutgers	63;	Hopkins	61
Hopkins	74;	Dickinson	73
Hopkins	74;	Washington	62
American	67;	Hopkins	40

WRESTLING

Virginia	28;	Hopkins	5
Delaware	20;	Hopkins	11
Loyola	16;	Hopkins	14
Gettysburg	26;	Hopkins	5
Maryland	31;	Hopkins	3
Swarthmore	18;	Hopkins	12
Franklin & Marshall	33;	Hopkins	3

GOLF

Hopkins	5;	Dartmouth	4
Maryland	7½;	Hopkins	1½
Western Maryland	6;	Hopkins	3
Loyola	6;	Hopkins	3
Franklin & Marshall	6;	Hopkins	3
Gettysburg	7½;	Hopkins	1½
Juniata	8;	Hopkins	1
Delaware	7;	Hopkins	2

TRACK

Hopkins	65;	Washington	57
Delaware	70;	Hopkins	61
Franklin & Marshall	65;	Hopkins	61
Hopkins	63;	Gettysburg	62
Swarthmore	70⅓;	Hopkins	55⅔
Hopkins	63;	Loyola	54

LACROSSE

Hopkins	14;	Loyola	5
Virginia	13;	Hopkins	12
Princeton	5;	Hopkins	4
Hopkins	8;	Army	7
Navy	10;	Hopkins	9
Hopkins	10;	Maryland	10
Mt. Washington	8;	Hopkins	7

BASEBALL

Hopkins	6;	Franklin & Marshall	0
Gettysburg	4;	Hopkins	3
Delaware	5;	Hopkins	1
Washington	11;	Hopkins	7
Loyola	3;	Hopkins	0
Hopkins	18;	Towson	7
Hopkins	12;	Western Maryland	2
Hopkins	5;	Catholic	4
Hopkins	19;	American	11
Hopkins	8;	Loyola	4
Hopkins	3;	Swarthmore	2

TENNIS

Hopkins	8;	American	1
Hopkins	7;	Loyola	2
Hopkins	5;	Delaware	4
Hopkins	3;	Gettysburg	0
Hopkins	9;	Western Maryland	0
Maryland	8;	Hopkins	1
Catholic	7;	Hopkins	2
Hopkins	8;	Towson	1
Hopkins	6;	Western Maryland	3
Hopkins	5;	Washington	4
Hopkins	8;	Loyola	1

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ciation has also elected a panel of officers for the 1952–53 season: Norman N. Holland, president; Edward McP. Armstrong, Milton Erlanger, Thomas P. Magill, Vincent Mehling, and W. Nelson Young, vice presidents; Gregory S. Rivkins, treasurer; Robert L. McAll, secretary. Members of the New York executive board include Carl Buchheister, W. Miles Cary, Jr., George S. Cattanach, Carlos M. del Valle, Allan R. Dixon, John Henderson, III, James R. Lomauro, Joseph F. Rooney, Alfred L. Tuvin, John R. Webster, J. Brent Wells, and Donald W. White.

THE ALUMNI

The late J. M. T. Finney, Hopkins professor of surgery, has been honored by the dedication in his name of the new headquarters of the Baltimore chapter of the American Red Cross, of which he was chairman for six years. The building was dedicated as the John M. T. Finney Memorial.

Reginald Harvey Griffith, g. '94–'96 (Engl.), has retired to become professor emeritus of English at the University of Texas, where he has taught for nearly fifty years.

Friend E. Clark, Ph.D. '02, was honored at a testimonial dinner of the Northern West Virginia Section of the American Chemical Society. A member of the society for fifty years, he was recently awarded a fifty-year membership certificate at special ceremonies.

Payton Rous, B.A. '00, M.D. '05, was one of three scientists to receive the Anna Fuller Memorial Prize, awarded by the American Association for Cancer Research for outstanding and original research on the role of viruses in cancer.

Herbert McLean Evans, M.D. '08, fac. '08–'15, has been awarded the

Passano Foundation Award of 1952 for distinguished research on hormones.

Lloyd Van Doren, Ph.D. '12 (Chem.), has been reelected secretary of the American Institute of Chemists.

Parker C. Williams, B.A. '23, has been named a regional director of the U. S. Wage Stabilization Board.

Arthur F. Abt, M.D. '23, has been appointed professor of pediatrics at the Duke University School of Medicine and director of the radioisotope unit for the Veterans Administration Hospital in Durham, N. C.

Carroll E. Dobbin, Ph.D. '24, was awarded the honorary degree of doctor of engineering at commencement exercises of the Colorado School of Mines.

Merrill F. Unger, B.A. '30, Ph.D. '47 (Oriental Seminary), was awarded a $1,000 prize for his *Introductory Guide to the Old Testament*. Dr. Unger is now professor of Old Testament at Dallas Theological Seminary and is the author of the recently released *Biblical Demonology*.

I. Alvin Pasarew, B.E. '30, M.S. in Engr. '48 (San.), has been appointed consultant and executive director of the advisory council to the Air Research and Development Command. He is director of the Maryland State Planning Commission.

James Frenkil, '30–'33 (Arts), has been named a fellow in the Industrial Medical Association.

Edgar F. Long, Ph.D. '32 (Educ.), has been made dean of students at the University of Maryland.

William P. Richardson, C.P.H. '33, has been appointed professor of preventive medicine and assistant dean in charge of continuation education at the University of North Carolina School of Medicine.

John Fuller Taylor, g. '33–'36 (Chem.), Ph.D. '37 (Physiol. Chem.), has become professor of biochemistry and head of the department at the University of Louisville School of Medicine.

Stewart Wolf, B.A. '34, M.D. '38, has resigned from Cornell University Medical College to become professor and head of the department of medicine at the University of Oklahoma School of Medicine.

George L. Engle, M.D. '38, has been elected president-elect of the American Psychosomatic Society.

Myron E. Wegman, M.P.H. '38, fac. '39–'46, has been appointed to the staff of the Pan American Sanitary Bureau, World Health Organization Regional Office. Dr. Wegman has been head of the department of pediatrics at the Louisiana State University School of Medicine.

Eugene A. Gillis, M.P.H. '39, has been appointed chief of the health division of the Technical Cooperation Mission to Beirut.

Erwin C. Drescher, M.P.H. '40, has been appointed chief of the Division of Commissioned Officers, U. S. Public Health Service.

Andrew Hedmeg, M.P.H. '41, has been appointed director of the division of preventive medicine in the Louisiana State Department of Health.

Edith Runge, Ph.D. '42 (Ger.), has been promoted to associate professor of German at Mt. Holyoke College. Dr. Runge is head of the German department.

Robert C. Stephenson, Ph.D. '43 (Geol.), has been named a vice president of the Pennsylvania Academy of Science.

Sidney Cobb, fac. '46–'47, has been named assistant professor of biostatistics and epidemiology at the University of Pittsburgh.

Lawrence A. Hoffman, Ph.D. '50 (Geog.), has been appointed assistant professor of geography at Ohio State University.

Nachum L. Rabinovitch, M.A. '50 (Math.), g. '50–'52, has been named rabbi of Congregation Agudas Achim, Dallas, Texas.

Gabriel F. Tucker, Jr., M.D. '51, has been appointed assistant professor of pharmacology at the University of North Carolina School of Medicine.

Milford H. Hatch, D.Sc. in Hyg. '51, has been named assistant professor of biology at Brown University.

DEATHS

(*Dates are 1952, unless otherwise noted.*)

W. Ernest F. Armstrong, '96–'97 (Arts), May 5.

Maude Alice Best, '04 (Nursing), February 8.

Maxine Bonitz, '18 (Nursing), January 11.

Frank Mosby Burton, g. '91–'92 (Chem.), March 16, 1948.

Emma Osborne Cleaver-Parrott (Mrs. Frederick Parrott), '91 (Nursing), December 11, 1951.

Robert E. Lee Collins, B.A. '21, Ph.D. '28 (Geol.), fac. '28–'36, April 22.

Philip Dettelbach, B.A. '04, April 12.

John Sharpe Dickinson, B.A. '13, LL.D. (hon.) '48, April 9.

Frances Pullen Elliott (Mrs. Addison E.), '97–'99 (Med.), July 12, 1950.

Edith Susannah Gardiner, g. '25–'26 (Educ.), October 15, 1950.

Minnie Allen Gove (Mrs. Chester), '10 (Nursing), January 1.

Russell Landram Haden, M.D. '15, April 26.

Harry Louis Homer, '96–'00 (Arts), associate emeritus in surgery, July 27, 1951.

Charles F. F. W. Lamm, g. '87–'90 (Semitics), April 30.

Gilbert Johnston McKelvey, fac. '35–'38, February 27, 1951.

Helen E. Mullin, '05 (Nursing), January 20.

David Marion Newbold, '91–'93 (Arts), April 10.

Harold Hastings Newman, M.D. '13, December 24, 1951.

Edward Livingston Palmer, Jr., B.A. '99, May 13.

Edward C. Phillips, Ph.D. '08 (Math.), May 9.

Sigmar Pirosh, '43 (Hyg.), April 20.

Philip K. Roos, A.P.L. '51–'52, April 1.

Philip Sachs, g. '03–'04 (Pol. Econ.), April 15.

Farrand Sayre, M.A. '36 (Philos.), Ph.D. '38, April 17.

Charles Edwin Sevier, M.D. '16, March 8.

Paul Leo Shanahan, Jr., '50–'51 (McCoy), November 7, 1951.

John Stewart Shaw, '05–'06 (Arts), April 26.

Evelina C. Verplanck (Mrs. J. DeLancey), g. '16–'17 (Cl. Archaeol.), April 22.

John J. Wolford, Ph.D. '32 (Geol.), February 19.

BOOKS

Henry A. Atkinson: *Theodore Marburg: The Man And His Work* ('80–'81, Arts; M.A. '02, hon.; trustee '02–'45).

Abraham Flexner, B.A. '86, LL.D. '49: *Funds and Foundations, Their Policies Past and Present.*

George Grassmuck, Ph.D. '49 (Pol. Sci.): *Sectional Biases in Congress on Foreign Policy* (The Johns Hopkins Press).

Dorothea Leighton, M.D. '36, fac. '37–'42 (and C. Kluckhohn): *The Navaho;* and *Children of the People.*

Forrest Shreve, B.A. '01, Ph.D. '05 (Bot.), fel. '05–'06, fac. '07–'08: *Vegetation of the Sonoran Desert,* Vol. I.

Glen Levin Swiggett, g. '89–'90, '92–'93 (Ger.): *Stepping-Stones of Time.*

Nothing To Lose But Its Brains

Continued from page 10

the 1930's, and the comparative hard times for farmers, business men, lawyers, doctors, and most other occupations, drew an unprecedented number of able young men into graduate work. The proportion taking doctor's degrees (excluding M.D.'s) rose nearly a third—from about 1.3 per cent of all degrees to about 1.7 per cent. Since the war, the awards of advanced degrees have declined in relative numbers to the former level, but most of the stock of Ph.D.'s is, of course, still attached to teaching and may take some time to shift to government civil service or industrial laboratories.

The academicians can be counted on, moreover, to do everything in their power to increase this supply or keep it from falling. James Petrillo, head of the Musicians' Union, once said in an attack on the recording of music that his occupation was the only one which produced its own competition. He overlooked the professor, who produces his future competition with joy and is especially pleased when it turns out to have a better quality and tone than the original.

CONTRIBUTING to the plentifulness of supply has been the impressive migration since 1935 of scholars from other lands. One in five full professors now listed in the Johns Hopkins catalogue, for example, got his advanced training outside the United States, and my impression is that the situation is not greatly different at other American universities. This exogenous—and presumably temporary—enlargement of the ranks of senior academicians may help to account for their particularly unfavorable position in relation to the junior personnel, only about five per cent of whom at Hopkins are foreign-trained. No liberal-minded person would deplore the inflow—it has enriched our scholarship, if not our scholars—but in accounting for the weakening in the American professor's salary position, it cannot be entirely put aside.

Not to be overlooked also is the temporary drop in the number of undergraduates. One reason for the high employment and income of teachers in the great depression was that, except for a shallow dip in 1932, youths continued to seek the baccalaureate—in part because they found degree-getting the least unprofitable use of their idle time. Enrollments increased after World War II also, but the fear that postwar crowding of classrooms might be temporary held the universities back from permanent expansion and led them to focus their hiring on instructors and assistant professors. Full professors are now

The Guy Memorial Walk

"In memory of a friend of the Johns Hopkins University who admired the beauty of its campus," the Robert F. Guy Memorial Walk was dedicated at Homewood last month. Remsen Hall is at the right in the photograph above, and Homewood House in the background. The walk is lined with benches given by the Class of 1949 in ceremonies held in connection with the walk's dedication. The tablets below mark the two gifts.

PHOTOGRAPHS BY JACK ENGEMAN

fewer than thirty-two per cent of the Hopkins staff, in contrast to nearly forty-one per cent in 1940, and associate professors only thirteen per cent as against eighteen per cent at the earlier date.

The apprehension that enrollments would decrease was justified. Not only have several million youths recently gone into military service, but the phenomenal deficit of births in the 1930's has bequeathed us a much smaller population between eighteen and twenty-one years of age than we had in 1940.

BECAUSE the persons of undergraduate age a decade hence are now alive, their number can be forecast rather accurately. Their population will remain depressed through 1955, then rise seventeen per cent by 1960 and fifty per cent by the mid-1960's. Enrollment in the final year of high school, now in a trough, is expected by the Bureau of the Census to rise forty per cent by 1960. In addition, the proportion of youths that go to college should continue the long-term increase that has already raised it from one in twenty-five of college age in 1900 to one in four before the Korean outbreak. Thus, if there is no all-out war, enrollments will greatly expand during 1955–65.

At the same time, if the inflation lasts, the proportion of doctors of philosophy who stay on as "teachers of the love of wisdom" is rather likely to decline. Large numbers of those who leave academic work will not be easily won back, or develop in ways that enhance their attractiveness to the universities. A moderately spirited competition for higher academic personnel may be expected to take place in the second quinquennium of the 1950's and in the first one of the 1960's, and should result in a noticeable bidding-up of real salaries.

HOWEVER, professors are not likely ever to be enormously affluent compared with persons having more practical modes of livelihood. In fact, there are reasons for fearing that the long-term trend is unfavorable to all learned occupations. First, manual workers, farmers, and small business men are increasingly well organized and can be counted on to push ever more aggressively toward higher wages and prices. Second, the proportion of the population with advanced training has enlarged tremendously over the last half-century, and a major increase in the relative supply of anything usually cheapens its relative price.

Also, the public has in recent years accorded the university teacher an esteem that would be gratifying, were it not for the suspicion that it is in lieu of more negotiable income. An opinion survey for the President's Commission on Higher Education brought out that college professors are regarded by the man in the street as seventh in prestige from the top of a list of ninety occupations ranging from Justice of the United States Supreme Court to shoe-shine boy—above lawyers, bankers, ministers, business men with a hundred employees, corporation directors, and even above airline pilots!

WILL this glamor suffice in itself to sustain the supply of university teachers, if real earnings of academicians continue to bear their present particularly unfavorable relation to those of other occupations? Certainly, the purveying of learning at too low a value is no new problem. Adam Smith, himself a professor, quotes with feeling from Isocrates, who is reproaching the pedagogues of his own day with inconsistency:

"They make the most magnificent promises to their scholars, says he, and undertake to teach them to be wise, to be happy, and to be just, and in return for so important a service they stipulate the paltry reward of four or five minae. They who teach wisdom, continues he, ought certainly to be wise themselves; but if any man were to sell such a bargain for such a price, he would be convicted of the most evident folly."

Changing Your Address?

Please notify the Johns Hopkins Magazine as soon as you know your new location.

It will help if you will enclose your present address label with your notification.

Send it to the Johns Hopkins Magazine, Homewood, Baltimore 18, Md.

100 Flights A Day

Continued from page 6

store numbers and operate with them according to the usual laws of arithmetic. These latter machines are more adaptable and more accurate than the first group, but in general they are slower and much harder to operate.

To see how problems are solved, how information is taken directly from the simulated flying missile, go along on a series of flights with the laboratory pilots.

You enter an instrument room lined with multi-dialed cabinets and lights connected by a myriad of wires. Here and there you see an electronic finger writing the story of another flight on a strip of moving paper. You are ignored by three or four of the machine operators, who glue their eyes to the recorders and to the many flickering meters and glowing lights or to the wavering green design on an oscillograph. The operator with whom you will ride shows you to a stool in front of a bank of cabinets which look like giant radio receiving sets with an abundance of volume controls. The flight problem has been prepared in advance and is wired into the machine, ready to go.

It all began several days ago when the problem was presented for solution. First the method of computation was decided upon and the voltage scales (volts per foot of range, etc.) selected so that neither excessive voltage nor very small voltage (giving rise to poor accuracy) would occur. Then the wir-

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Alumni Homecoming

Hundreds of Johns Hopkins alumni came back to the University last month for Homecoming Weekend—a three-day round of activities which included banquets, dances, fraternity open houses, class reunions, the Hopkins-Maryland lacrosse game, and a pre-game luncheon in Homewood Gym. The lacrosse game ended in a 10–10 tie after two overtime periods; a review of other events is in the pictures on these pages.

◄ John T. Rettaliata, B.E.'32, Dr. Eng.'36, who last month was inaugurated as president of Illinois Institute of Technology, was guest speaker at annual meeting of Johns Hopkins Engineers.

Luncheon preceding lacrosse game was a highlight of weekend's events.

There were the traditional parades of classes . . .

. . . and a parade of floats designed by fraternities . . .

. . . and attendance at the Hopkins-Maryland game . . .

Photographs by Jack Engeman

. . . and the crowning of a Homecoming Day queen.

100 Flights A Day

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ing diagram for the machine was prepared and the problem wired in. The process may have taken one to three days, depending on the problem's complexity; then one to two days were spent checking the machine setup by testing portions of the circuit separately and by calculations on standard problems whose solutions were known.

The "flight" is now ready. Electrical circuits have been applied to handle numbers and equations; the mathematics, in other words, have become mechanized. The computing machines are chocked full of physically installed mechanized equations.

You take your place and fasten your eyes on the dials on the panel before you. The operator flicks a small switch. The machines begin to hum as the simulated missile warms up. A button responds to the touch and the simulated flight is under way.

On a one-to-one time scale, the trip would take around two minutes. The operator can, however, give the simulated missile even greater speed or slow it drastically in order to study the rocket and its strange journey in more detail.

You are looking, perhaps, at the design of a system which will keep a missile in an upright position during its flight. The operator points to results for a variety of volume-control-type settings in the missile. At a low setting, he explains, the missile rolls too much, due to miscellaneous aerodynamic torques. At a high setting the roll is small, but the missile is nearly unstable and "jitters around" too much. But in between, within this band of values, the roll control is satisfactory. There is enough margin in this band of settings to facilitate manufacture of the missile.

"We are operating on a ten-to-one time scale to observe more detail," the operator says. "Note the high-altitude runs being made now; the value of the gain settings is quite different, but the roll control shows the same behavior, and the margin of operation is still adequate. The computation has proved that this design of a roll-control system will be satisfactory."

The Applied Physics Laboratory's computing machines, when set up for a "test flight," are a complex maze of equipment. Here Francis O. Bliss, Jr., makes a final check before pressing the starting button which will launch the test.

The mathematician in charge of the problem now proposes a calculation on another system. There, the object of study is the accuracy of the guidance of the missile, and the flights are on a one-to-one time scale. The guidance system of a missile is being adjusted to determine the best setting of the controls for different types of targets at different ranges and altitudes.

"This takes a great many runs," someone says, "but the programmer here does all the work for us."

The operator explains how the unit, interconnected through a pre-wired plugboard, automatically operates the recorder, turns on the REAC, selects the next flight condition, and repeats. It has been operating nearly two hours; in this time, nearly a hundred flights have been made without anyone's touching the machine.

The Applied Physics Laboratory's REAC group has three separate installations of computing machines, so that several simple problems may be handled simultaneously without interference with one another. But all machines are connected by cables to allow solution of complex problems which require more than one installation.

"Last summer," says an operator, "we had to make a very complete missile simulation. All the machines were hooked together and controlled from one programmer. Checking the problem was in itself a major job; we were using all the auxiliary equipment which had been added to the original machine. We keep designing and adding new components and modifying the old ones, in order to keep up with increasing demands. At present, we are concentrating on equipment which will provide special stored data to be fed into the computers.

"On our third computer we now have an interesting problem. We are hooked up to missile components located in another room. In this case a one-to-one time scale is mandatory. Motor-driven tapped potentiometers are generating aerodynamic coefficients as a function of time along the missile's trajectory; servos are used to solve the trigonometric equations and a cathode-ray function generator is putting in the nonlinearities in the aerodynamic coefficients. The function generator contains a photocell which makes a spot of light ride on the top of an opaque mask which has been cut in a shape to reproduce a plotted function.

"We are comparing the results obtained here with previous computations in which the missile components were simulated by circuits in the computer. The agreement is good, so only a few runs need be made. The earlier results are more complete than those we are making now, since they include tolerance studies which are difficult to make

on actual components. Comparison of computed flights with actual flights also shows good agreement; in fact, diagnosis of past flights is aided considerably by duplicating the experiments on the computer."

ANSWERS to almost any problem can be found on the REAC's. But some problems, especially those which require a high degree of accuracy, must be done on "MADDIDA" (*M*agnetic *D*rum *D*igital *D*ifferential *A*nalyzer). MADDIDA is a special-purpose digital computer internally coded to solve differential equations. Because of its specialized nature it is much easier to operate than most general-purpose digital machines.

Instead of representing numbers by voltages in a circuit (as in REAC), MADDIDA represents them by magnetized spots on a magnetic drum. These are read at the rate of one hundred thousand per second, computed with and restored on the drums. Every digit of the stored information, called a "bit," is examined sixty-six times a second. The results produced by the computer are in the form of numbers. The machine moves slowly; the overall computing time for a single problem is usually one to three hours.

THE REAC and simulator section deals with more than simulated missile flights. In line with basic research at the Applied Physics Laboratory, temperatures and pressure distributions in the hearts of giant stars have been studied. The staff has computed and tabulated statistical functions useful in the theory of turbulence and has studied the shape of spectral lines taking into account the slit width of the spectroscope.

But the shirtsleeved laboratory pilots will continue to make trips that defy the imagination. For results they can point to the Navy Aerobee, the high-altitude sounding rocket developed at the Applied Physics Laboratory, and to the ramjet engine, another APL specialty of vast importance.

And someday, when another missile is developed and goes roaring off into space above the Naval Ordnance Test Station at Inyokern, California, the men and women of the REAC and simulator group may look up casually and remark, "We've watched it go aloft a thousand times."

On Becoming A Freeman

Continued from page 7

torical apprenticeships in the trades, skills, and professions, this one, as student, has paid you a wage. Perhaps you have been unaware of it; it has been paid nevertheless. Its payment has been visible and open for anyone to see. It is in the form of benefits which you have received on account of the investment in this University by Johns Hopkins in 1867 when the certificate of incorporation was signed. Down the years this investment has been increased

Dr. Bowman

by other donors until today the invested funds and the plant of the University have been increased from the original three million dollars to over fifty million dollars.

EVERY time you have entered a classroom, or used a library, or received the award of a scholarship, you have enjoyed the dividends on an investment that neither you nor your family made. That investment was made by others for your benefit. It was made by men and women who had faith that one day you would be here and would justify their gifts. They sought to improve society, to promote its welfare through the work of the University. Only service by you can repay the debt.

Your apprenticeship here has taught you skills and qualified you, we hope, for membership in a guild as all apprenticeships do. There are two historic responsibilities of guild membership: the first is quality of output; the second is a sense of obligation. A guild member has duties as well as privileges. Whether you are a teacher or a business man or an engineer or a physician or a musician or a government official or a lawyer or a journalist, hereafter you are one of these things not on your individual account only, but as a member of the University Guild. Every act you perform, every standard you maintain, every service you render, ought to reflect a sense of guild responsibility.

THE third way in which a man could become a Freeman of York was by redemption, by order of the Court of Mayor and Alderman. This order was reserved for men of great achievement. We shall not be satisfied if you do not attempt this qualification also. As you look upon the great deeds of men of the past, you may well ask in humility what it is that you, with your limited powers, can do to achieve greatness. You do not expect to become, let us say, a great general, a great painter, a great writer, in the sense of George Washington, or Rembrandt, or Shakespeare. Why then do men strive for the highest standards of achievement in action, in science, in art? If you can never hope to surpass or even to equal these men, why engage in the effort?

In his book on *Words*, Kipling has given the answer. Greatness is a word which we reserve for men of long-continued achievement. It is their sustained power as well as their high standards that make them stand out apart from other men. But there is no reason at all why you cannot do a piece of work in your chosen field perhaps as great as the work of the greatest, and thus, adds Kipling, "feel the magic of the thing flow through you again."

BUT to feel that magic of creation, to gain the high road, requires character and purpose and ideals. That word Redemption may sound quaint to you as applied to men of achievement who thus may win the status of Freeman. In colonial days in America, a Redemptioner was one who, wishing to migrate from Europe to America, secured passage on credit, binding himself to service to the owner of the

THE SUMMER
at Johns Hopkins

JUNE 16, MONDAY—Instruction begins in general biology and in courses in chemistry, summer session.

JUNE 21, SATURDAY—Summer session registration, Remsen Hall, 9 a.m. to 4 p.m.

JUNE 23, MONDAY—Instruction begins in summer session.

JULY 4, FRIDAY—Legal holiday, no classes.

JULY 12, SATURDAY—Instruction continues on this Saturday.

JULY 31, THURSDAY—Final examinations at 2 p.m. for first-period classes.

AUGUST 1, FRIDAY—Final examinations at 9 a.m. for second-period classes.

Final examinations at 2 p.m. for third-period classes.

AUGUST 8, FRIDAY—Final examinations in general biology and in courses in chemistry.

EARLY AUTUMN DATES

SEPTEMBER 13 AND 20, SATURDAYS—Registration, McCoy College.

SEPTEMBER 15–20, MONDAY–SATURDAY—Registration in the Faculty of Philosophy and the School of Engineering for part-time students.

SEPTEMBER 17–24, WEDNESDAY–WEDNESDAY—Orientation Program.

SEPTEMBER 22 AND 23, MONDAY AND TUESDAY (late afternoon and evening)—Registration, McCoy College.

SEPTEMBER 22–24, MONDAY–WEDNESDAY—Registration in the Faculty of Philosophy and the School of Engineering for full-time students at all levels. Students will be advised when to register.

SEPTEMBER 25, THURSDAY—Beginning of instruction, all schools and departments at Homewood.

ship for a stipulated time until the debt was redeemed. I like to think that you are under similar bondage today and that only great deeds somewhere along the road of life will be considered by you a sufficient discharge of the debt. If you are truly modest no deed that you can ever perform will seem to you sufficient to pay the debt. That conceit of having paid enough might exist in other societies; it can never exist in America.

The freer the man the greater his debt, to the persons, the institutions, the parents, the funds that set him free or wrote the terms of universal freedom which he shares with his fellow men. Your birthright was freedom in America. Here is one of the few places where freedom is so general that we may enjoy it by our Father's Copy. Your next task is to add skilled service and one day great achievement. Skills have been acquired by you with the help of this University, building on the aptitudes you inherited and cultivated. Great achievement will come only from things deep in your character. Men do not become great by accident. They must be willing to pay the price, and the price is heavy.

We shall be proud if you remember this occasion and these words in the years to come as you strive toward the goal of your life's desires. And we shall be proud if, remembering, you act on the idealism that surrounds and permeates the word Freeman. Only by continuing effort in the years to come can we keep the meaning of the word both clear and noble. A man who has earned the right to use the common land, to march in his community's great processions, to render skilled services through thorough and sound apprenticeship here at Hopkins, to return to his class reunions and to be conscious of having chosen a path and followed it—these are some of the senses in which we hope that you will regard this commencement.

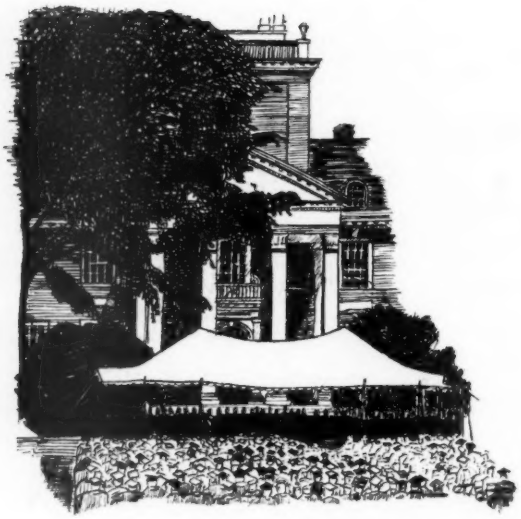
In this sense we welcome you to the Guild of the Hopkins Alumni today. It is an honorable guild known throughout the world. We hope to see you pursue the course of a man determined all his life to keep before him the goal of greatness in things little and big, in short a gentleman and a scholar with an unfailing sense of obligation toward the society of which, in America, he is a privileged member.

Werner Wolff

NEXT ISSUE

The Operations Research Office at Johns Hopkins has long been one of America's most hush-hush activities. Once, not even its name could be mentioned in print, and most of its work still is cloaked in a heavy veil of secrecy and military security regulations. But now a part of its story is being told, and operations research emerges as one of our most valuable "secret weapons." It has enormous non-military implications as well. Next issue, in words and pictures, *The Johns Hopkins Magazine* takes you to the Operations Research Office and introduces you to some of its activities and men. See the October issue of

THE JOHNS HOPKINS MAGAZINE



OUTDOOR COMMENCEMENT
AT JOHNS HOPKINS

What does it cost to educate a man? Far more than the tuition a student must pay. The difference must come from those who recognize the value of education and who, by their support, invest in its continuance and in our way of life.

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